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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/741,804	12/22/2000	Jun Hayakawa	501.39395X00	9059

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EXAMINER	
RENNER, CRAIG A	

ART UNIT	PAPER NUMBER
2652	

DATE MAILED: 12/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/741,804	HAYAKAWA ET AL.	
	Examiner	Art Unit	
	Craig A. Renner	2652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4 and 7-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4 and 7-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *05 December 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05 December 2005 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 4 and 7-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Pinarbasi (US 6,268,985).

With respect to claims 4, 7, 9, 11-12, and 15-16, Pinarbasi (US 6,268,985) teaches a magnetic head (40) having a magnetoresistive film (74/500, for instance)

comprising an anti-ferromagnetic layer (218), a ferromagnetic pinned layer (206), a non-magnetic intermediate layer (204), a soft magnetic free layer (208), a non-magnetic conductive oxidized stopper layer (504, lines 5-6 in column 9, for instance, i.e., "ruthenium" is a non-magnetic conductive oxidized stopper layer as it reads on applicant's definition thereof provided in lines 8-12 on page 5, for instance), and an oxide protective layer (506 and/or 508) of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof (line 65 in column 8 thru line 8 in column 9, for instance, i.e., layer 506 includes "Ta_2O_3", and/or lines 9-15 in column 9, for instance, i.e., layer 508 includes "Ta_2O_3") laminated in this order (as shown in FIG. 15, for instance) on a substrate (42), wherein the oxide protective layer is substantially oxidized entirely (i.e., "Ta_2O_3" is substantially oxidized entirely), and wherein an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (as shown in FIG. 15, for instance, i.e., an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer would be substantially zero in as broad as the term "substantially" may be construed due to the structure depicted in FIG. 15 and accompanying detailed description thereof) [as per claim 4]; wherein the thickness of the metal oxide protective layer is 1.0 nm or less (lines 7-8 in column 9, for instance, i.e., "between 5 Å to 50 Å" includes values within the range of "1.0 nm or less") [as per claim 7]; wherein the non-magnetic conductive oxidized stopper layer substantially prevents at least one of diffusion of oxygen from the metal oxide protective layer and propagation of stresses caused by oxides with respect

to the soft magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer (lines 5-6 in column 9, for instance, i.e., "ruthenium" prevents at least one of diffusion of oxygen from the metal oxide protective layer and propagation of stresses caused by oxides with respect to the soft magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer) [as per claim 9]; wherein the non-magnetic conductive oxidized stopper layer has a thickness so that the intermediate layer coupling field showing the magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will cause the intermediate layer coupling field showing the magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer to be substantially zero) [as per claim 11]; wherein the thickness of the non-magnetic conductive oxidized stopper layer enables a change of resistance to be maximized (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will enable a change of resistance to be maximized) [as per claim 12]; and wherein the non-magnetic conductive oxidized stopper layer is made of Cu (304 in the embodiment shown in FIG. 13, for instance) [as per claims 15 and 16].

With respect to claims 8, 10, 13-14, and 17-19, Pinarbasi (US 6,268,985) teaches a magnetic recording apparatus (30) including a magnetic recording medium (34) for recording information, a magnetic head (40) having a magnetoresistive film (72/500, for instance) comprising an anti-ferromagnetic layer (218), a ferromagnetic pinned layer (206), a non-magnetic intermediate layer (204), a soft magnetic free layer

(208), a non-magnetic conductive oxidized stopper layer (504, lines 5-6 in column 9, for instance, i.e., "ruthenium" is a non-magnetic conductive oxidized stopper layer as it reads on applicant's definition thereof provided in lines 8-12 on page 5, for instance), and an oxide protective layer (506 and/or 508) of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof (line 65 in column 8 thru line 8 in column 9, for instance, i.e., layer 506 includes "Ta_2O_3", and/or lines 9-15 in column 9, for instance, i.e., layer 508 includes "Ta_2O_3") laminated in this order (as shown in FIG. 15, for instance) on a substrate (part of 42), a head slider (rest of 42) for holding the magnetic head, an actuator (includes 46) for guiding the head slider to a predetermined recording position on the recording medium, a spindle motor (36) rotating the recording medium and a signal processing system (50) for processing information read out of the magnetic recording medium, wherein the oxide protective layer is substantially oxidized entirely (i.e., "Ta_2O_3" is substantially oxidized entirely), and wherein an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (as shown in FIG. 15, for instance, i.e., an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer would be substantially zero in as broad as the term "substantially" may be construed due to the structure depicted in FIG. 15 and accompanying detailed description thereof) [as per claim 8]; wherein the non-magnetic conductive oxidized stopper layer substantially prevents at least one of diffusion of oxygen from the metal oxide protective layer and propagation of stresses caused by oxides with respect to the soft magnetic free layer

and degradation of a soft magnetic characteristic of the soft magnetic free layer (lines 5-6 in column 9, for instance, i.e., "ruthenium" prevents at least one of diffusion of oxygen from the metal oxide protective layer and propagation of stresses caused by oxides with respect to the soft magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer) [as per claim 10]; wherein the non-magnetic conductive oxidized stopper layer has a thickness so that the intermediate layer coupling field showing the magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will cause the intermediate layer coupling field showing the magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer to be substantially zero) [as per claim 13]; wherein the thickness of the non-magnetic conductive oxidized stopper layer enables a change of resistance to be maximized (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will enable a change of resistance to be maximized) [as per claim 14]; wherein the non-magnetic conductive oxidized stopper layer is made of Cu (304 in the embodiment shown in FIG. 13, for instance) [as per claims 17 and 18]; and wherein the thickness of the oxide protective layer is 1.0 nm or less (lines 7-8 in column 9, for instance, i.e., "between 5 Å to 50 Å" includes values within the range of "1.0 nm or less") [as per claim 19].

Pertinent Prior Art

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. This includes Hayashi (US 6,178,073), which teaches a magnetic head (FIG. 6(h), for instance) having a magnetoresistive film comprising an anti-ferromagnetic layer (107), a ferromagnetic pinned layer (106), a non-magnetic intermediate layer (104), a soft magnetic free layer (102/103), a non-magnetic conductive oxidized stopper layer (part of 108, lines 15-25 in column 7, for instance, i.e., "Cu," for instance, is a non-magnetic conductive oxidized stopper layer as it reads on applicant's definition thereof provided in lines 8-12 on page 5, for instance), and an oxide protective layer (another part of 108, lines 15-25 in column 7, for instance) of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof (lines 20-22 in column 7, for instance, i.e., "oxides ... of ... Ti, ... Nb, ... Hf, Ta, [or] W") laminated in this order (as shown in FIG. 6(h), for instance) on a substrate (100).

Response to Arguments

5. Applicant's arguments filed 05 December 2005 have been fully considered but they are not persuasive.

The applicant argues that Pinarbasi does not teach "'wherein the oxide protective layer is substantially oxidized entirely', and 'wherein an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero'." This argument, however, is not found to be persuasive as Pinarbasi does teach an oxide protective layer (506, for

instance) being substantially oxidized entirely (see line 65 in column 8 thru line 8 in column 9, for instance, i.e., "Ta_2O_3", for instance, is substantially oxidized entirely), wherein an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between a ferromagnetic pinned layer (206) and a soft magnetic free layer (208) is substantially zero (as shown in FIG. 15, for instance, i.e., an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer would be substantially zero in as broad as the term "substantially" may be construed due to the structure depicted in FIG. 15 and accompanying detailed description thereof). Since the magnetic head of Pinarbasi is structurally no different than that claimed, it would inherently cause "an intermediate coupling field showing a magnitude of the ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer [to be] substantially zero." This is especially true in as broad as the term "substantially" may be construed.

The applicant further contends that "Pinarbasi provides no disclosure or teaching of ruthenium being an oxidized stopper layer." This argument, however, is not found to be persuasive for the following: The examiner may reference applicant's disclosure to find the definition of a non-magnetic and conductive oxidized stopper layer. Applicant defines a non-magnetic conductive oxidized stopper layer to be Ru in lines 8-12 on page 5, for instance. Therefore, Ru is a non-magnetic conductive oxidized stopper layer by definition.

The applicant lastly asserts that "Pinarbasi does not disclose that the thin film of ruthenium is oxidized." This, argument, however, is not found to be persuasive as

applicant's stopper layer is also by definition not oxidized, but is taught to be made of a non-magnetic and conductive material that stops oxidation, such as, "Cu, Pd, Pt, Os, Rh, Re, Ru, Ag and Au" as detailed in lines 8-10 on page 5, for instance. Additionally note that the drawings show stopper layer 15 to be elemental "Cu" at "0.4 nm" thickness.

Conclusion

6. All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig A. Renner whose telephone number is (571) 272-7580. The examiner can normally be reached on Tuesday-Friday 9:00 AM - 7:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, A. L. Wellington can be reached on (571) 272-4483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Craig A. Renner
Primary Examiner
Art Unit 2652

CAR